

## CLAIMS

What is claimed is:

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1. An apparatus comprising:
  - a processor cache unit to process a cache access request from a processor core of a processor, the processor cache unit including a processor cache controller and a processor cache; and
  - a chipset cache controller coupled to the processor cache unit to control a chipset cache located in a chipset in response to the cache access request from the processor core, the chipset being coupled to the processor via a bus.
2. The apparatus of claim 1 wherein the chipset cache controller comprises:
  - a chipset cache tag store to store tags corresponding to cache lines of the chipset cache; and
  - a coherency controller coupled to the chipset cache tag store to maintain cache coherency among the processor cache, the chipset cache, and a memory, according to a coherence protocol.
3. The apparatus of claim 2 wherein the coherency protocol is a modified, exclusive, share, and invalidated (MESI) protocol.



1           4.     The apparatus of claim 3 wherein the coherence controller  
2 comprises:

3                 a chipset interface circuit to send control signals to the chipset  
4 according to cache state and type of the cache access request, the  
5 control signals specifying an operation performed by the chipset.

1           5.     The apparatus of claim 4 wherein the control signals  
2 include at least a set identifier for a cache set in the chipset cache  
3 corresponding to the cache access request, a cache valid indicator  
4 asserted when a cache line in the cache set is valid, and a flush  
5 indicator asserted when the cache line is flushed.

1           6.     The apparatus of claim 5 wherein when the type of the  
2 cache access request is a read request and the cache valid indicator is  
3 not asserted, the operation includes one of a transfer of a data read  
4 from the memory to the cache set in the chipset cache and a transfer of  
5 a data read from the memory to the processor.

1           7.     The apparatus of claim 6 wherein when the flush indicator  
2 is asserted, the operation further includes a flushing of existing data at  
3 the cache set.

1           8.     The apparatus of claim 4 wherein when the type of the  
2 cache access request is a read request and the cache valid indicator is



3 asserted, the operation includes a transfer of a data read from the  
4 cache set to the processor.

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1 9. The apparatus of claim 4 wherein when the type of the  
2 cache access request is a write request, the operation includes a  
3 transfer of a data from the processor to the cache set in the chipset  
4 cache.

1 10. The apparatus of claim 9 wherein when the cache valid  
2 indicator is not asserted, the operation further includes a transfer of the  
3 data from the processor to the memory.

1 11. The apparatus of claim 9 wherein when the flush indicator  
2 is asserted, the operation further includes a flushing of existing data at  
3 the cache set.

1 12. The apparatus of claim 5 further comprising:  
2 a snoop circuit coupled to the chipset cache tag store to check if  
3 an address snooped on the bus matches with one of entries in the  
4 chipset cache tag store.

1 13. The apparatus of claim 12 wherein the set identifier  
2 specifies the cache set corresponding to the one of the entries that  
3 matches the address snooped on the bus.



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1 14. A method comprising:  
2 processing a cache access request from a processor core of a  
3 processor by a processor cache unit, the processor cache unit including  
4 a processor cache controller and a processor cache; and  
5 controlling a chipset cache located in a chipset in response to the  
6 cache access request from the processor core, the chipset being  
7 coupled to the processor via a bus.

1 15. The method of claim 14 wherein controlling the chipset  
2 cache comprises:  
3 storing tags corresponding to cache lines of the chipset cache in  
4 a chipset cache tag store; and  
5 maintaining cache coherency among the processor cache, the  
6 chipset cache, and a memory, according to a coherence protocol.

1 16. The method of claim 15 wherein the coherency protocol is  
2 a modified, exclusive, share, and invalidated (MESI) protocol.

1 17. The method of claim 16 wherein maintaining cache  
2 coherency comprises:



3 sending control signals to the chipset according to cache state  
4 and type of the cache access request, the control signals specifying an  
5 operation performed by the chipset.

1 18. The method of claim 17 wherein the control signals include  
2 at least a set identifier for a cache set in the chipset cache  
3 corresponding to the cache access request, a cache valid indicator  
4 asserted when a cache line in the cache set is valid, and a flush  
5 indicator asserted when the cache line is flushed.

1 19. The method of claim 18 wherein when the type of the cache  
2 access request is a read request and the cache valid indicator is not  
3 asserted, the operation includes one of a transfer of a data read from  
4 the memory to the cache set in the chipset cache and a transfer of a  
5 data read from the memory to the processor.

1 20. The method of claim 19 wherein when the flush indicator is  
2 asserted, the operation further includes a flushing of existing data at  
3 the cache set.

1 21. The method of claim 17 wherein when the type of the cache  
2 access request is a read request and the cache valid indicator is  
3 asserted, the operation includes a transfer of a data read from the  
4 cache set to the processor.



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1           22. The method of claim 17 wherein when the type of the cache  
2 access request is a write request, the operation includes a transfer of a  
3 data from the processor to the cache set in the chipset cache.

1           23. The method of claim 22 wherein when the cache valid  
2 indicator is not asserted, the operation further includes a transfer of the  
3 data from the processor to the memory.

1           24. The method of claim 22 wherein when the flush indicator is  
2 asserted, the operation further includes a flushing of existing data at  
3 the cache set.

1           25. The method of claim 18 further comprising:  
2 checking if an address snooped on the bus matches with one of  
3 entries in the chipset cache tag store.

1           26. The method of claim 25 wherein the set identifier specifies  
2 the cache set corresponding to the one of the entries that matches the  
3 address snooped on the bus.

1           27. A system comprising:  
2 a memory to store data;  
3 a chipset coupled to memory having a chipset cache; and



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4 a processor coupled to the memory and the chipset via a bus, the  
5 processor including a processor core and a cache unit, the cache unit  
6 comprising:

7 a processor cache unit to process a cache access request  
8 from the processor core, the processor cache unit including  
9 a processor cache controller and a processor cache, and  
10 a chipset cache controller coupled to the processor cache  
11 unit to control the chipset cache in response to the cache  
12 access request from the processor core.

1 28. The system of claim 27 wherein the chipset cache controller  
2 comprises:

3 a chipset cache tag store to store tags corresponding to cache  
4 lines of the chipset cache; and

5 a coherency controller coupled to the chipset cache tag store to  
6 maintain cache coherency among the processor cache, the chipset  
7 cache, and a memory, according to a coherence protocol.

1 29. The system of claim 28 wherein the coherency protocol is a  
2 modified, exclusive, share, and invalidated (MESI) protocol.

1 30. The system of claim 29 wherein the coherence controller  
2 comprises:



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3 a chipset interface circuit to send control signals to the chipset  
4 according to cache state and type of the cache access request, the  
5 control signals specifying an operation performed by the chipset.

1 31. The system of claim 30 wherein the control signals include  
2 at least a set identifier for a cache set in the chipset cache  
3 corresponding to the cache access request, a cache valid indicator  
4 asserted when a cache line in the cache set is valid, and a flush  
5 indicator asserted when the cache line is flushed.

1 32. The system of claim 31 wherein the cache unit further  
2 comprising

3 a snoop circuit coupled to the chipset cache tag store to check if  
4 an address snooped on the bus matches with one of entries in the  
5 chipset cache tag store.